ANALYSIS AND PERFORMANCE OF A 12-PULSE HIGH POWER REGULATOR

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ABSTRACT

Under work being performed to upgrade the 20 Kilowatt CW uplink transmitters of the NASA Deep Space Network (DSN), the high voltage regulator has been revisited in order to optimize its performance, (long-term stability and regulation), and enhance field reliability,

The prime regulation specification imposed on the high voltage power supply (HVPS) is on the order of 0.025% which translates to a maximum of 5 V p-p at the -20 kV nominal operating level. This stability must be maintained over the duration of a mission track which can last from a few minutes to over (12) twelve hours. These requirements are derived from the Klystron tube operating parameters and the low close-in phase noise requirements (All an variance) necessary to communicate with the space-borne platforms now traveling through, and beginning to exit, the solar system.

Existing stations have exhibited peak to peak variations ranging from 10 V to greater than 50 V. In addition to this, the field stations have reported reliability problems with the pass-tube regulator largely due to life cycle performance. For these masons, investigations were initiated to identify those components and design approaches which could be modified or otherwise improved. Chief among these were the 12-pulse HVPS transformer build, rectifier/filter and pass regulator. Data is presented comparing the unregulated and regulated performance of the HVPS prior to, and after, modifications. As part of the ongoing JPL upgrade effort, it is hoped that this report will represent the opening of an ongoing dialogue documenting the overall improvement of the DSN uplink transmitters, especial] y with respect to increasing y critical RF performance requirements.

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